

Fremont Valley Groundwater Basin

- Groundwater Basin Number: 6-46
- County: Kern, San Bernardino
- Surface Area: 335,000 acres (523 square miles)

Basin Boundaries and Hydrology

Fremont Valley Groundwater Basin underlies Fremont Valley in eastern Kern County and northwestern San Bernardino County. The basin is bounded on the northwest by the Garlock fault zone against impermeable crystalline rocks of the El Paso Mountains and the Sierra Nevada. This basin is bounded on the east by crystalline rocks of the Summit Range, Red Mountain, Lava Mountains, Rand Mountains, Castle Butte, Bissel Hills, and Rosamond Hills. The basin is bounded on the southwest by the Antelope Valley Groundwater Basin along a groundwater divide approximated by a line connecting the mouth of Oak Creek through Middle Butte to exposed basement rock near Gem Hill.

Average annual rainfall in the Fremont Valley ranges from 4 to 12 inches. Surface water in Fremont Valley drains toward Koehn (dry) Lake; however, surface drainage overlying the southwesternmost part of the basin is southward toward the town of Rosamond.

Hydrogeologic Information

Water Bearing Formations

Both Quaternary alluvium and lacustrine deposits are water-bearing; however, the alluvium is the most important water-bearing material in the basin (DWR 1969). Alluvium is about 1,190 feet thick (Bader 1969; DWR 1964) along the margin of the basin and thins toward the middle of the basin, where it is interbedded with thick layers of lacustrine silt and clay near Koehn Lake. Groundwater in the alluvium is generally unconfined, although locally confined conditions occur near Koehn Lake (DWR 1964). Average well yield is about 530 gpm with a maximum yield of 2,580 gpm (DWR 1975).

Restrictive Structures

The Garlock and El Paso fault zones, which extend along the foothills of the Sierra Nevada and El Paso Mountains, form restrictive groundwater barriers on the west and northwest sides of the basin (Dibblee 1967). The Cantil Valley fault traverses the northeast part of the basin, but its effect on groundwater is not known. The Muroc fault traverses the central part of the basin and forms a partial barrier to groundwater flow (DWR 1964).

Recharge Areas

Natural recharge of the basin includes percolation of ephemeral streams that flow from the Sierra Nevada. The general groundwater flow direction is toward Koehn Lake at the center of the valley (Bader 1969; DWR 1964). There is no appreciable quantity of groundwater flowing out of the basin (Bader 1969).

Groundwater Level Trends

In the southwestern part of the basin, groundwater flows from near Oak Creek northward toward the town of Mojave and continues under the surface drainage divide toward Koehn Lake. Elsewhere in Fremont Valley Groundwater Basin, groundwater flows toward Koehn Lake.

A hydrograph for one well west of Koehn Lake indicates a decline in groundwater level of about 92 feet between 1960 and 1980. During 1980 through 1998, the water level stabilized in this well, fluctuating about 4 feet. Hydrographs indicate that groundwater elevations declined in the southwestern part of the basin about 9 feet between 1957 and 1999, in the center of the basin about 5 feet between 1967 and 1998, in the northwest part of the basin about 6 feet between 1979 and 1997, and east of Koehn Lake about 25 feet between 1967 and 1999.

Groundwater Storage

Groundwater Storage Capacity. The total storage capacity of the basin is calculated to be 4,800,000 af (DWR 1975).

Groundwater in Storage. Unknown.

Groundwater Budget (Type C)

Average annual well pumping was about 32,000 acre-feet during the 1950s through early 1960s (DWR 1964).

Groundwater Quality

Characterization. Groundwater is sodium bicarbonate character in the southeastern part of the basin and sodium bicarbonate or calcium-sodium sulfate character in the southwest part of the basin. Groundwater is sodium sulfate-bicarbonate to sodium chloride character in the northern part of the basin. Groundwater character is complex with variable mixtures of sodium, calcium, chloride, sulfate, and bicarbonate in the central portion of the basin (DWR 1964).

TDS content ranges from 400 to 700 mg/L in the southeastern part of the basin, 800 to 1,000 mg/L in the southwest part of the basin, and 350 to 1,100 mg/L in the northern part of the basin (DWR 1964). Data from 10 public supply wells in the basin show an average TDS content of 596 mg/L and a range of 398 to 1,400 mg/L.

Impairments. Groundwater in parts of the basin has high concentrations of fluoride and sodium. Groundwater near Koehn Lake has sodium and chloride concentrations of 10,000 and 14,000 mg/L respectively (DWR 1964). TDS concentrations near Koehn Lake reach 100,000 mg/L (Bader 1969; DWR 1969).

Water Quality in Public Supply Wells

| Constituent Group ¹ | Number of wells sampled ² | Number of wells with a concentration above an MCL ³ |
|--------------------------------|--------------------------------------|--|
| Inorganics – Primary | 14 | 0 |
| Radiological | 11 | 0 |
| Nitrates | 15 | 0 |
| Pesticides | 13 | 0 |
| VOCs and SVOCs | 12 | 0 |
| Inorganics – Secondary | 14 | 5 |

¹ A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

² Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

³ Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Production characteristics

| | Well yields (gal/min) | |
|----------------------|-----------------------|-------------------------|
| Municipal/Irrigation | Maximum: 4,000 | Average: 500 (DWR 1964) |
| | Total depths (ft) | |
| Domestic | | |
| Municipal/Irrigation | | |

Active Monitoring Data

| Agency | Parameter | Number of wells /measurement frequency |
|---|---|--|
| USGS | Groundwater levels, Miscellaneous water quality | 23 wells |
| Department of Health Services and cooperators | Title 22 water quality | 13 wells |

Basin Management

Groundwater management:

Water agencies

Public

Private

California Water Service Company

References Cited

- Bader, J.S. 1969. *Ground-Water Data as of 1967 South Lahontan Subregion California*. U.S. Geological Survey. Water Resources Division. Open-File Report. 25p.
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- _____. 1969. *Water Wells and Springs in the Fremont Valley Area, Kern County, California*. Bulletin 91-16. 157p.
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- _____. 2001. Groundwater Level Data. <http://well.water.ca.gov> (September 2001).
- Dibblee, T.W. Jr. 1967. *Areal Geology of the Western Mojave Desert California*. Geological Survey Professional Paper 522. 153p.

Errata

Substantive changes made to the basin description will be noted here.